BERNSTEIN

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EUROPEAN METALS & MINING

Build, Buy or Buyback – Where are we in the cycle?

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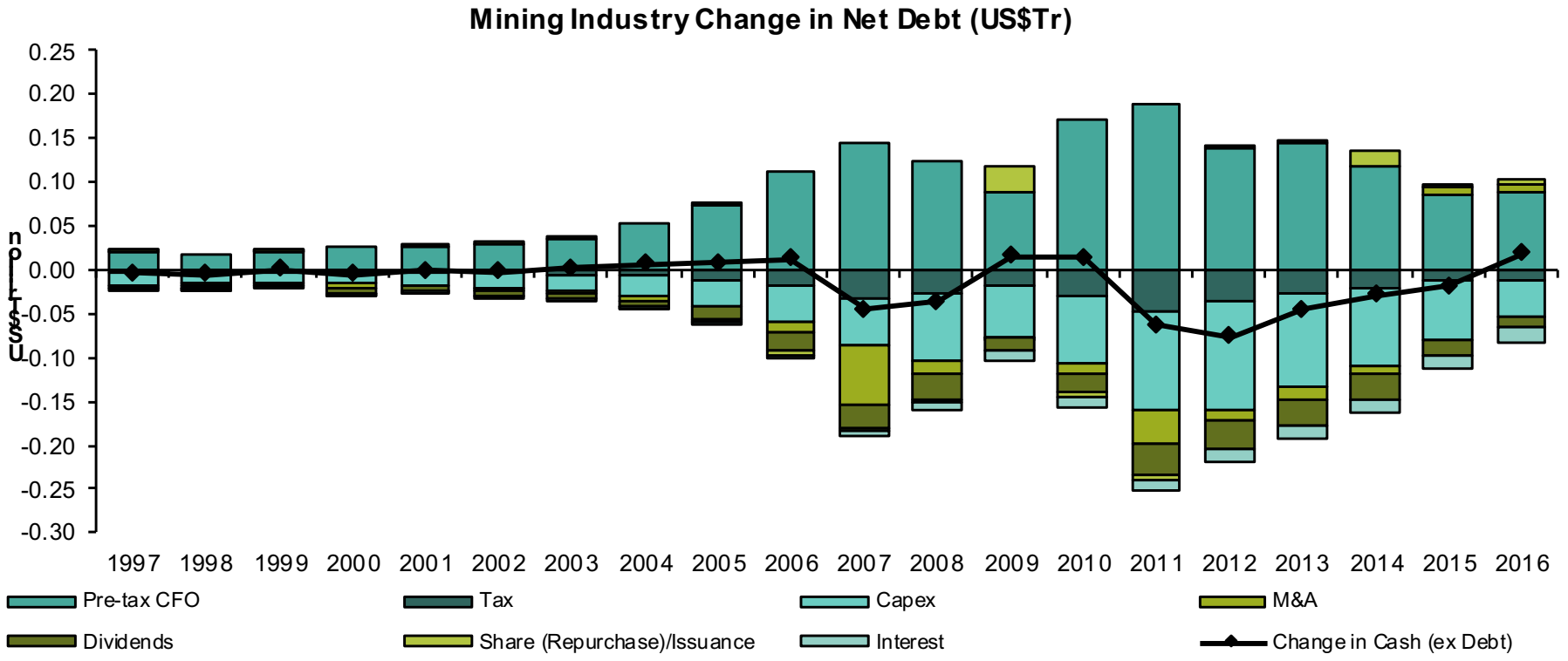
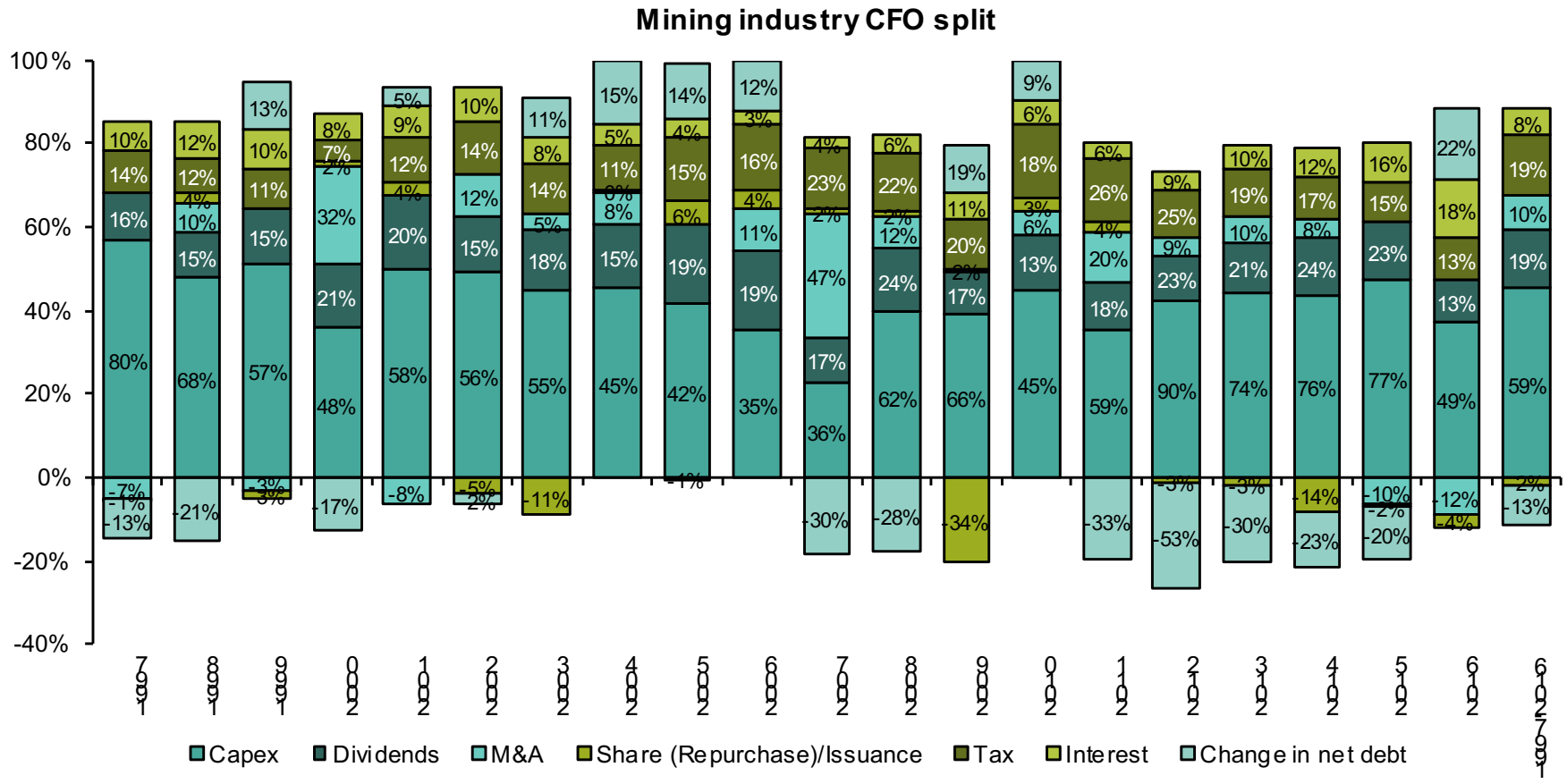
Where have we come from? A brief history of the “super-cycle”



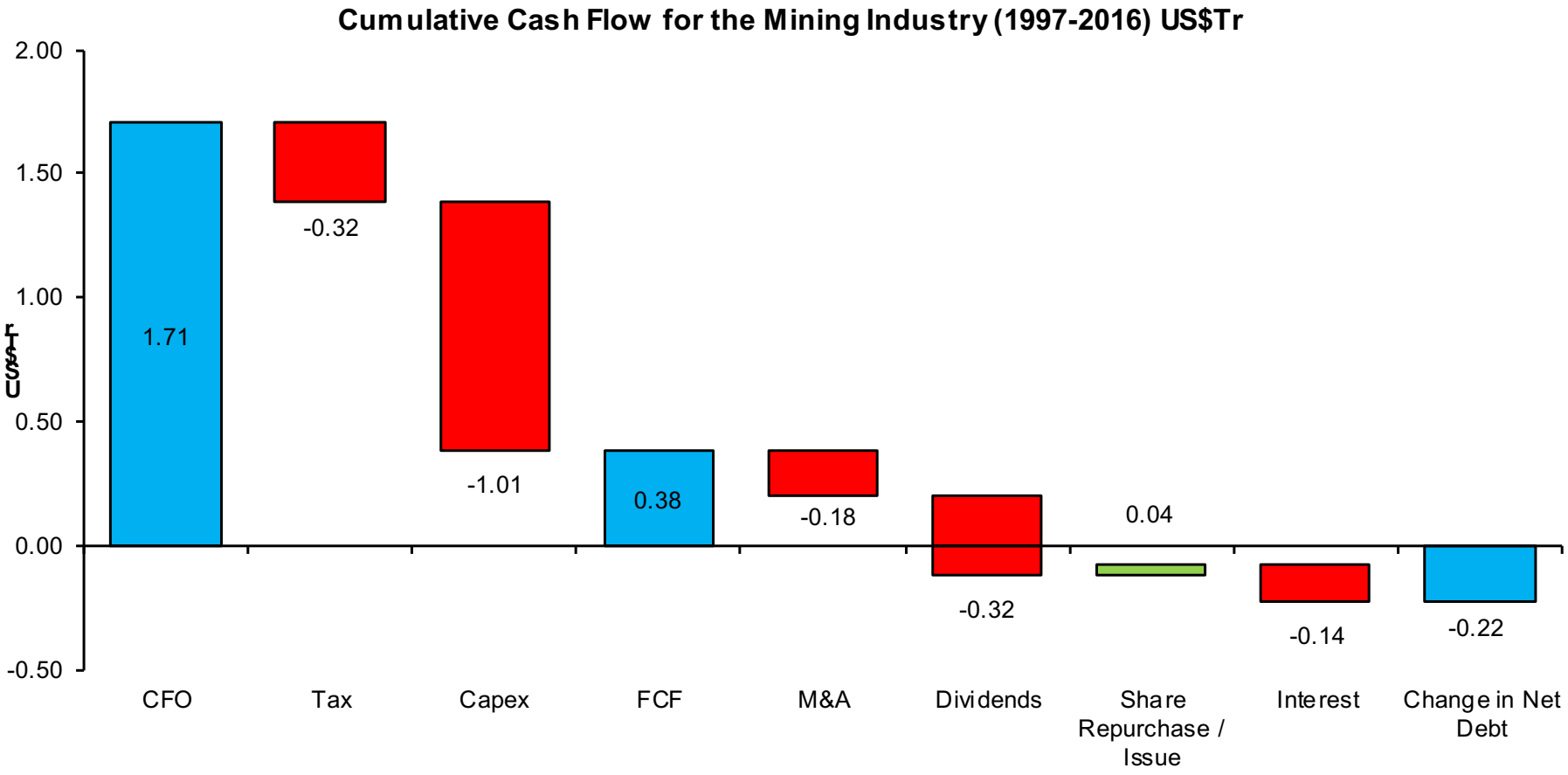
Source: Factset, Bloomberg, Company reports, Bernstein analysis

Clear prioritisation of the “build” decision over other alternatives



Source: Factset, Bloomberg, Company reports, Bernstein analysis

Leading to over US$1 Trillion of capital being invested in new supply…



Source: Factset, Bloomberg, Company reports, Bernstein analysis

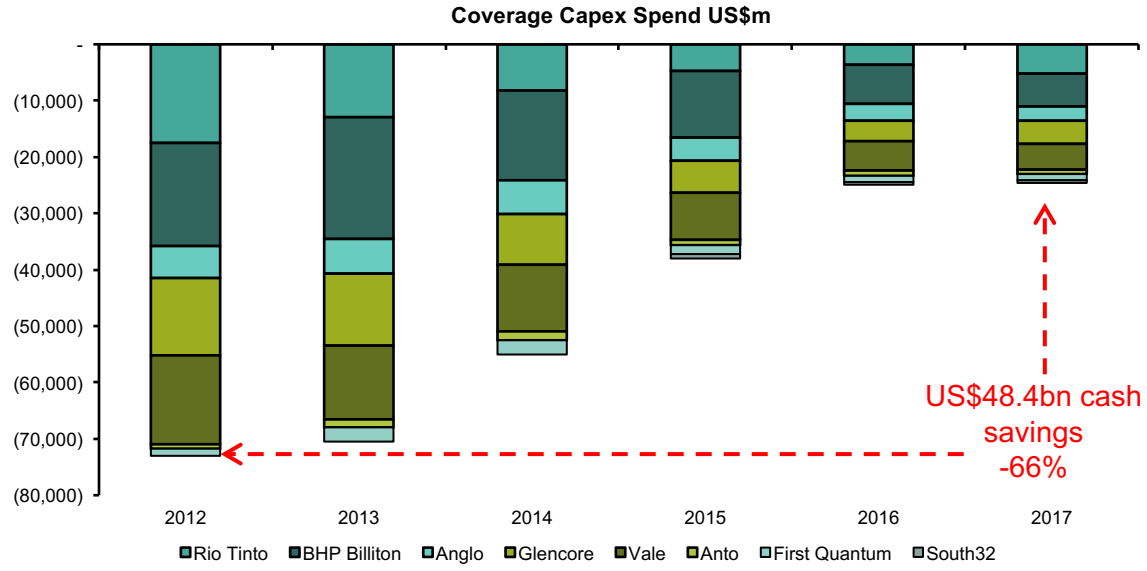
…and contributing to one of the worst mining recessions in history

+ In terms of the severity the crisis of 2011-2016 was the 4th most severe price correction of the industrial age and is the longest since 1878

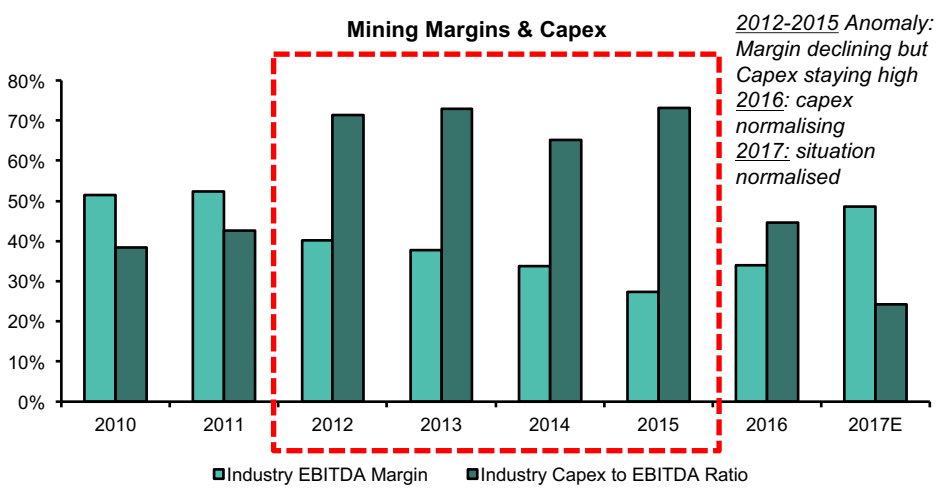
Rank	Start	End	Duration	Initial Price - US$/t	End Price - US$/t	Total Price Loss - %	US/Global Recession	
1	1929	1932	3	405	128	(68.4%)	Yes	Great Depression
2	1917	1921	4	644	279	(56.7%)	Yes	Post WW1 recession/1921 depression
3	1864	1870	6	1,020	455	(55.4%)	Yes	Post US Civil War recession
4	2011	2016	5	9,868	4,599	(53.4%)	No	-
5	1872	1878	6	728	364	(50.0%)	Yes	Panic of 1872 and Long Depression
6	1995	1999	4	3,050	1,670	(45.2%)	No	-
7	1882	1886	4	408	243	(40.5%)	Yes	Panic of 1884
8	1890	1894	4	347	211	(39.3%)	Yes	Panic of 1890 in UK
9	1956	1958	2	926	580	(37.4%)	Yes	-
10	1907	1911	4	441	277	(37.2%)	Yes	Panic of 1907 & 1910
11	1809	1813	4	735	465	(36.7%)	Yes	-
12	1899	1902	3	388	256	(34.1%)	Yes	-
13	1989	1993	4	2,890	2,020	(30.1%)	Yes	1990 oil shock
14	1980	1982	2	2,230	1,610	(27.8%)	Yes	-
15	2007	2009	2	7,230	5,320	(26.4%)	Yes	Great Recession
16	1820	1823	3	601	449	(25.3%)	Yes	-
17	1805	1808	3	826	621	(24.8%)	Yes	Revolutionary wars
18	1937	1938	1	295	225	(23.7%)	Yes	Recession of 1937
19	1880	1881	1	444	340	(23.5%)	No	-
20	1815	1817	2	636	496	(22.0%)	Yes	Panic post end of 1812 war

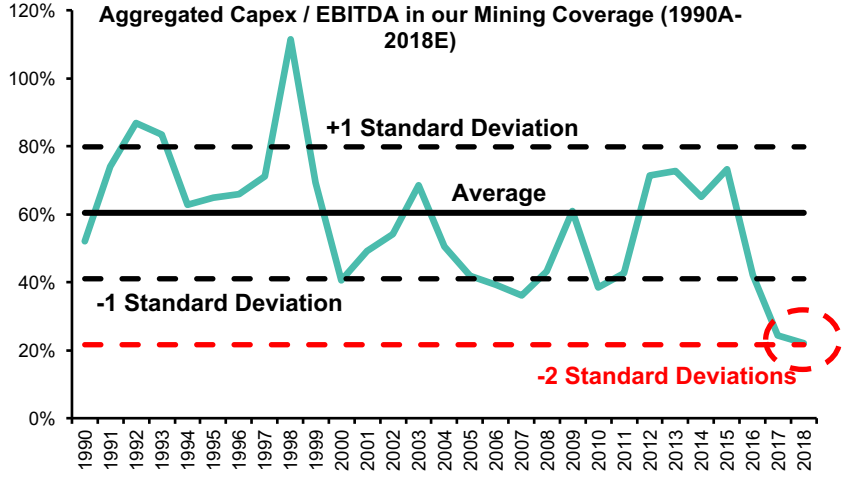
Source: Wood Mackenzie, AME, CRU, Bloomberg L.P., and Bernstein estimates and analysis.

Capital discipline at work in the entire sector… at last



- The magnitude of cash savings is huge on the capex line
- **Between 2012-2015:** industry EBITDA margins declined, but capex as % of EBITDA remained high
- The situation started to normalise in 2016…
- … but where do we go from here?

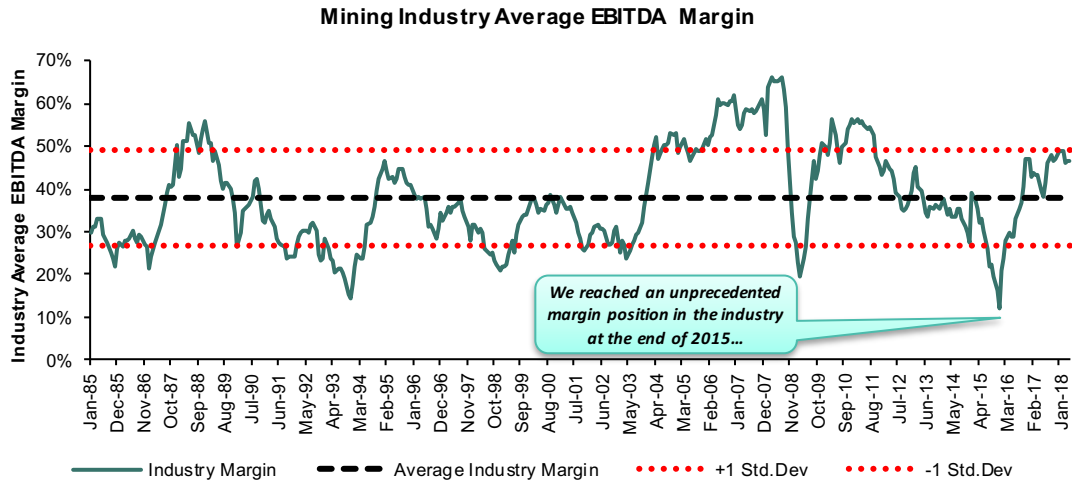


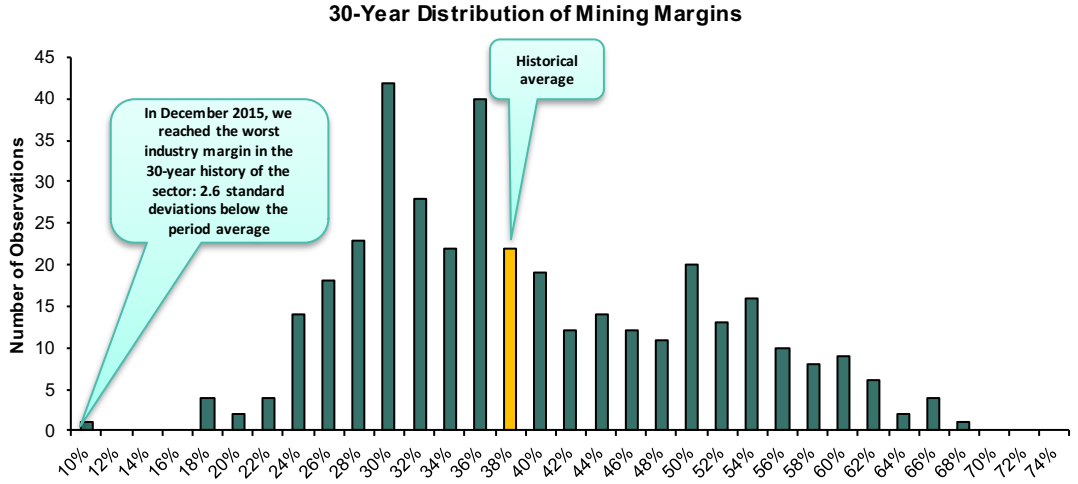


Source: Corporate reports, Bernstein analysis and estimates

So where are we now?

Clearly, there has been a recovery (as is always the case)



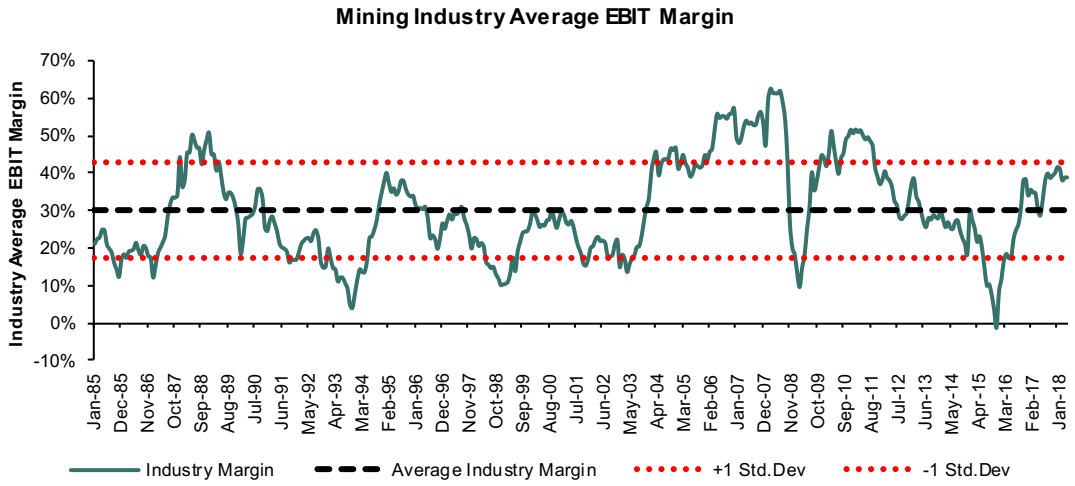


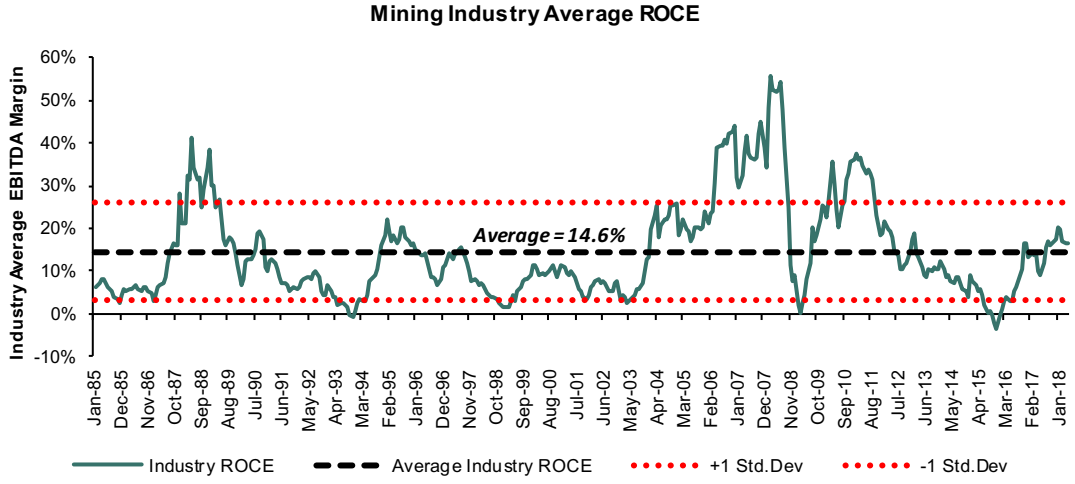
- Looking at the average EBITDA margin of the mining industry on a monthly basis, the exhibit shows that industry EBITDA margins in 2015/16 were the lowest they have been at any point over the last 30 years
- Industry margin was 2.6 standard deviations below the 30-year average!

- EBITDA margins that are over two standard deviations below their historical average, and in line with or below the very lowest EBITDA margins we have seen at any point over the last 30 years, are simply not strong enough to achieve the three purposes of margin generation: to pay taxes, to pay the providers of capital, and to reinvest for future production

Source: Wood Mackenzie, AME, CRU, Bloomberg L.P., and Bernstein estimates and analysis.

But the recovery is not yet strong enough (with a few exceptions) to really drive confidence that new investment is required



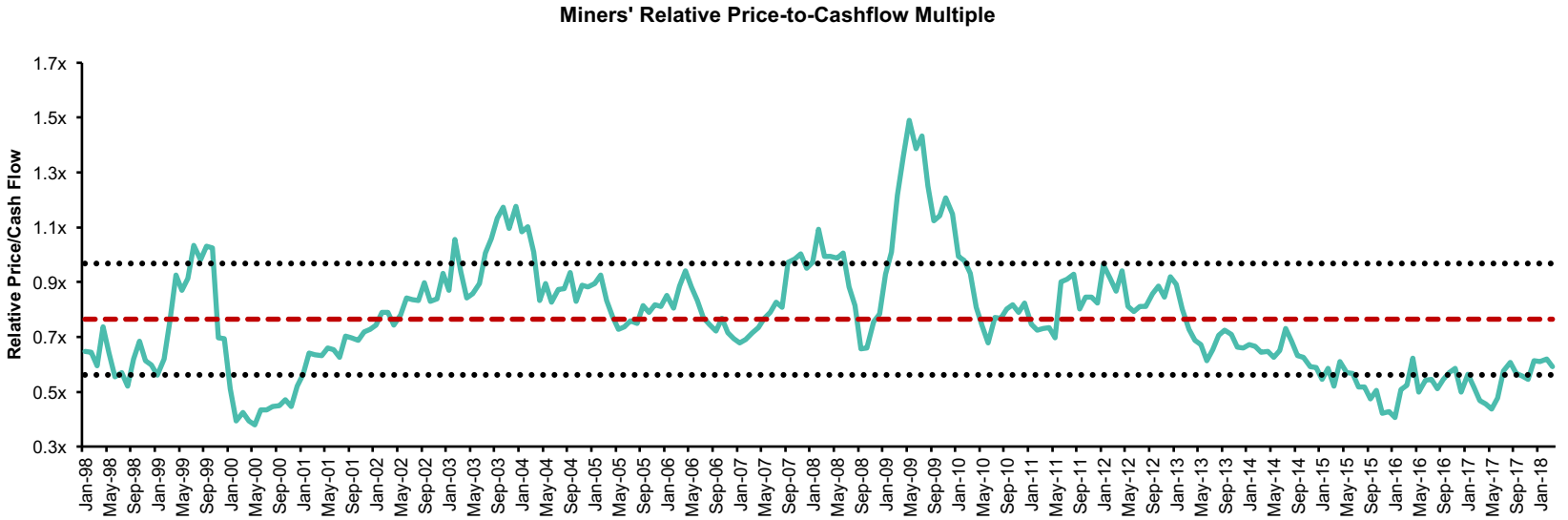


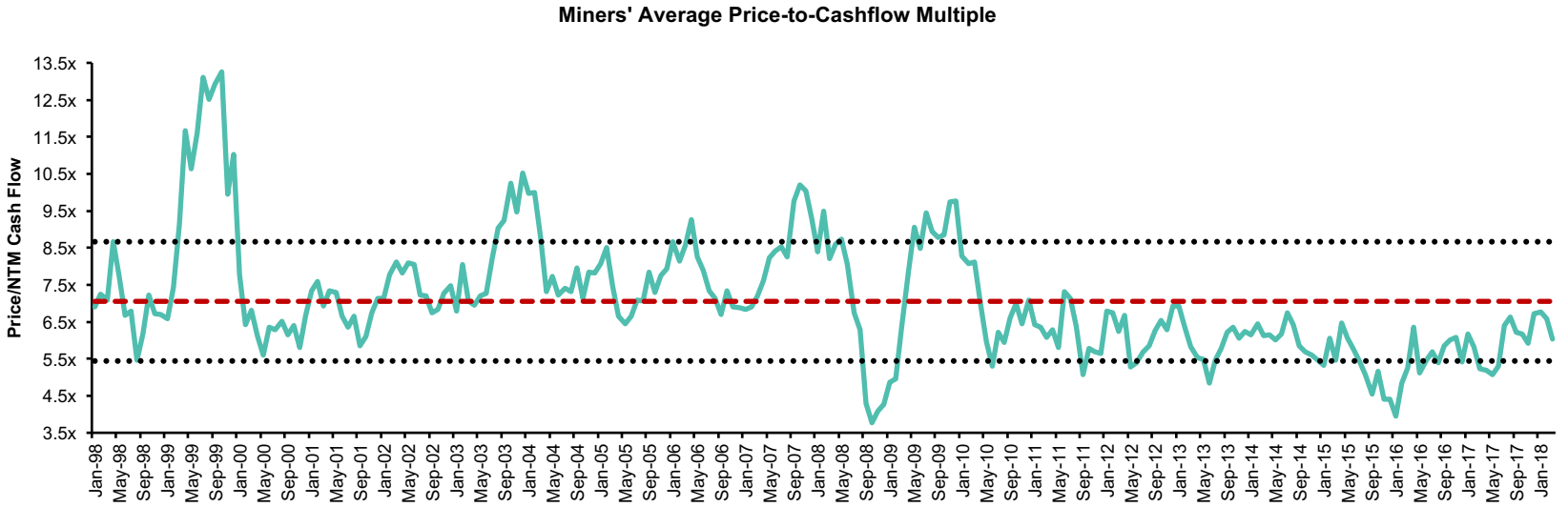
- We reached the nadir of EBIT margin generation in December 2015, when margins reached a record low of (1.3%). Subsequently, we saw some cost taken out across the industry, as we had expected we would, and then a rebound in commodity prices which saw EBIT margins jump back dramatically

- Since the beginning of 1985, the mining industry has generated a nominal return on capital of 14.6%, the distribution of those returns is largely clustered around the 6-12% range, but with a long tail of much higher returns from various points in time. As such, the median nominal ROCE over this period is much lower than the mean, at 10.7%

Source: Wood Mackenzie, AME, CRU, Bloomberg L.P., and Bernstein estimates and analysis.

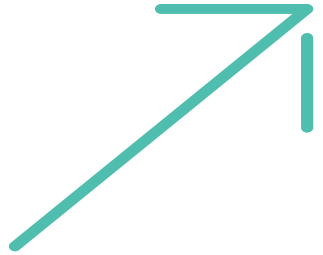
And we see this lack of confidence reflected in mining valuations…





Source: Factset, Bloomberg L.P., and Bernstein analysis.

Does the market value organic growth?



Strong balance sheets, robust margins, so what to do with the cash?

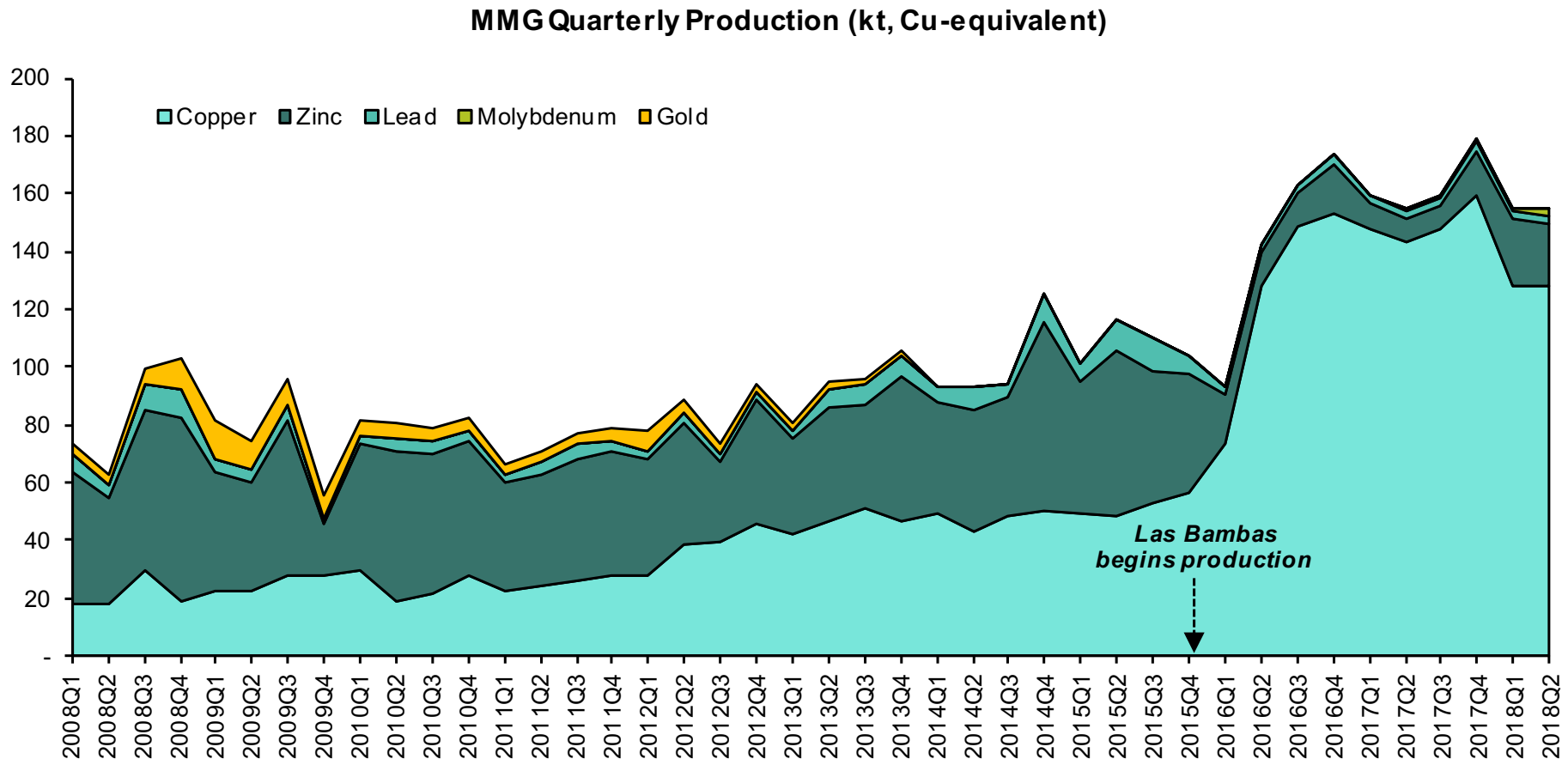
	Build	Buy	Buyback
Timing of Cashflows	Significant delay	Immediate	Immediate
Risk on Investment	High technical/execution risk	Information asymmetry risk	None
Impact on Commodity Markets	Potentially significant	None	None
Equity Market Response	Only once build complete	Immediate	Immediate

- A buyback represents a (near) zero premium acquisition of assets of identical quality to those already held by the company…they are the same assets.
- Buying assets implies paying a premium to add someone else's assets to the portfolio.
- Building assets, of course, implies allocating capital to the creation of an entirely new asset.

To the extent that either buying or building assets represents the addition of new units of supply that are of a lower quality – both from a financial and a technical perspective – to the assets that already exist in the portfolio, it is always better to simply buy back your own shares.

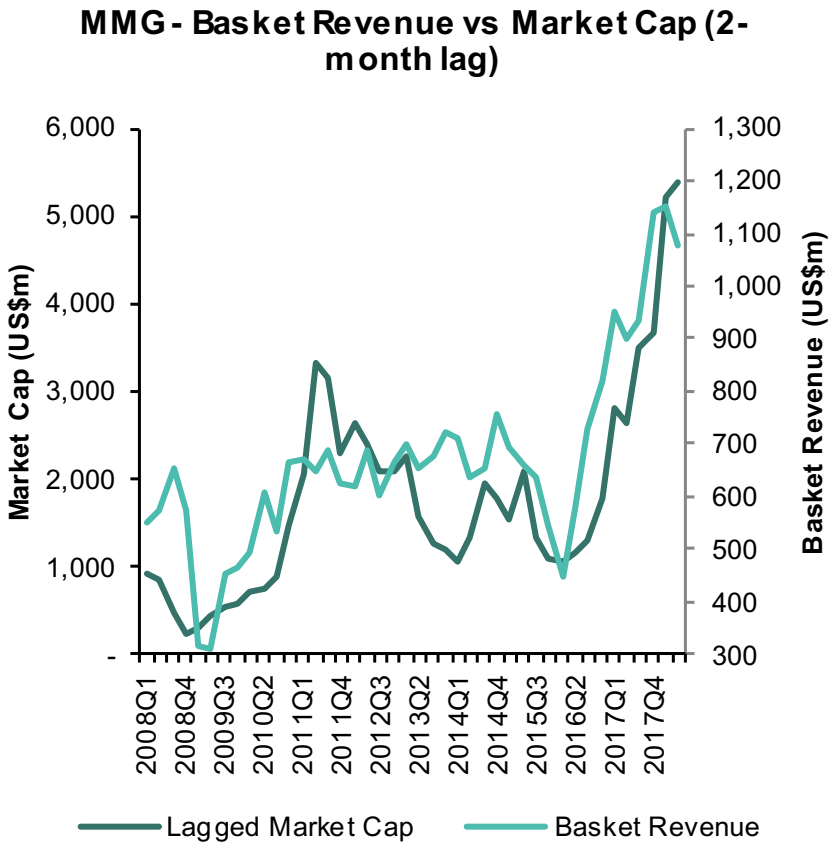
The justification for investment is an increase in overall portfolio quality.

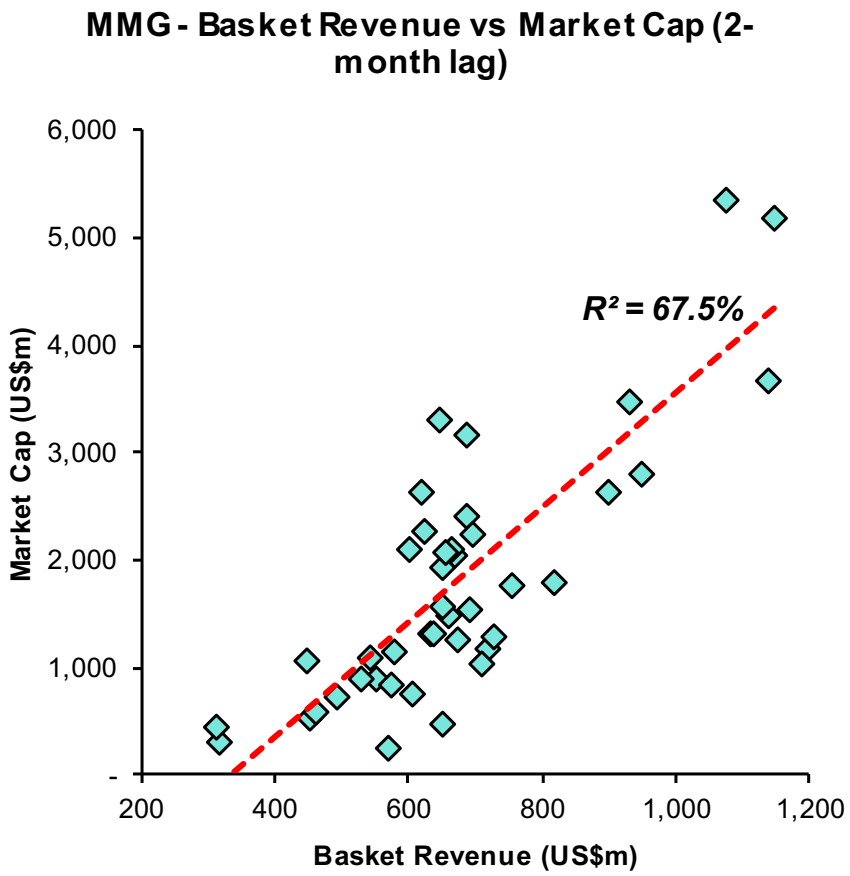
Building mines…does anyone in the market care? A case study from MMG and Las Bambas



Source: Bloomberg, Company reports, Bernstein analysis

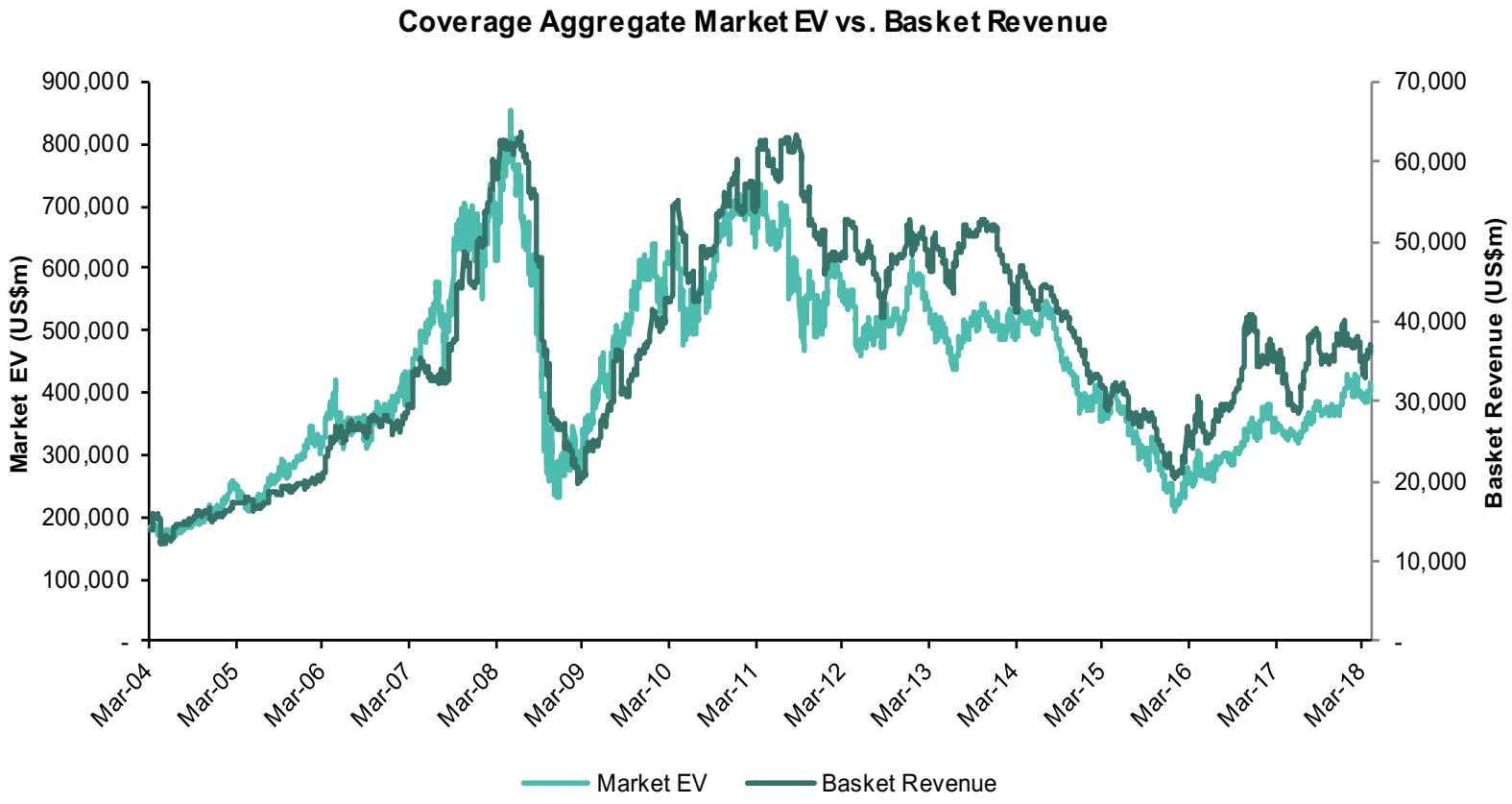
Basically, no. The market gives credit to the “build” decision only when the tonnes hit the market…





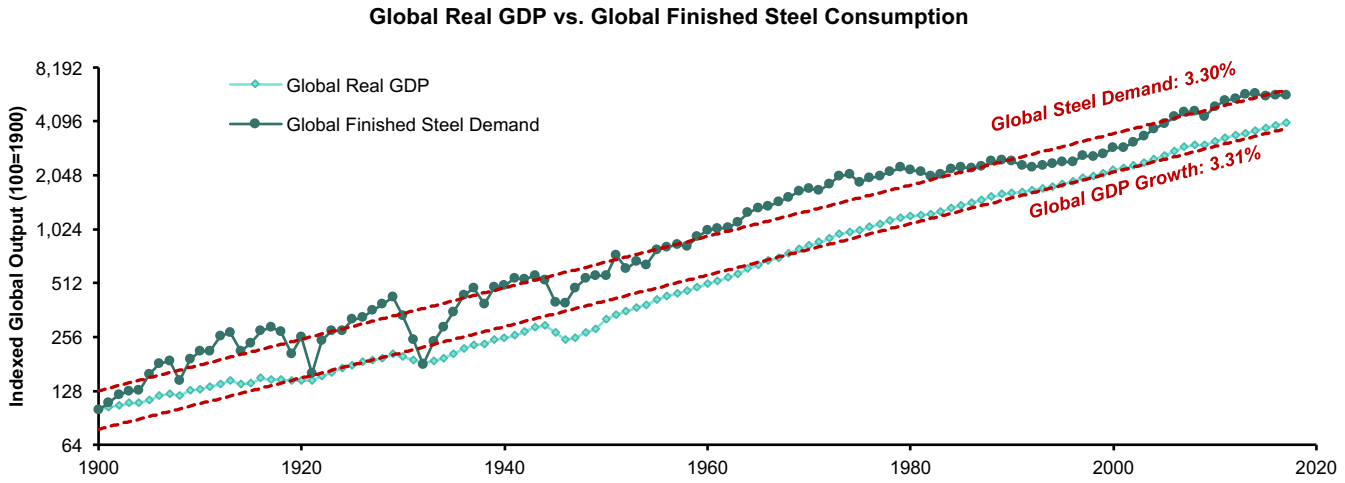
Source: Bloomberg, Company reports, Bernstein analysis

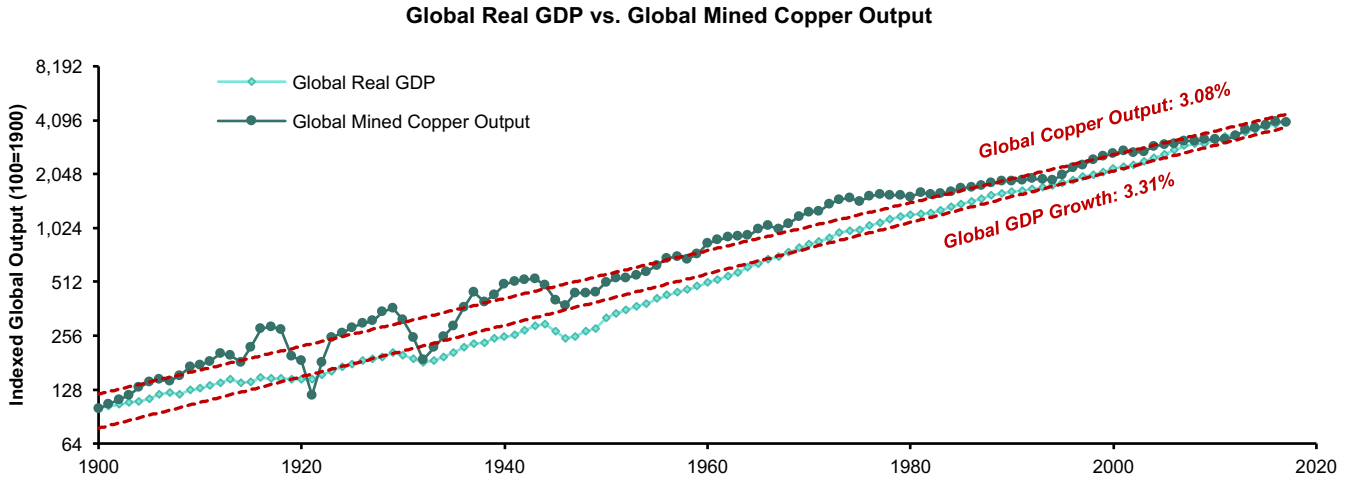
…which also explains the fact that company valuations track implied daily revenue baskets almost identically



Source: Bloomberg, Corporate Reports, McCloskey, Bernstein analysis

But this is problematic…after all, global economic growth is predicated on the flow of raw materials…



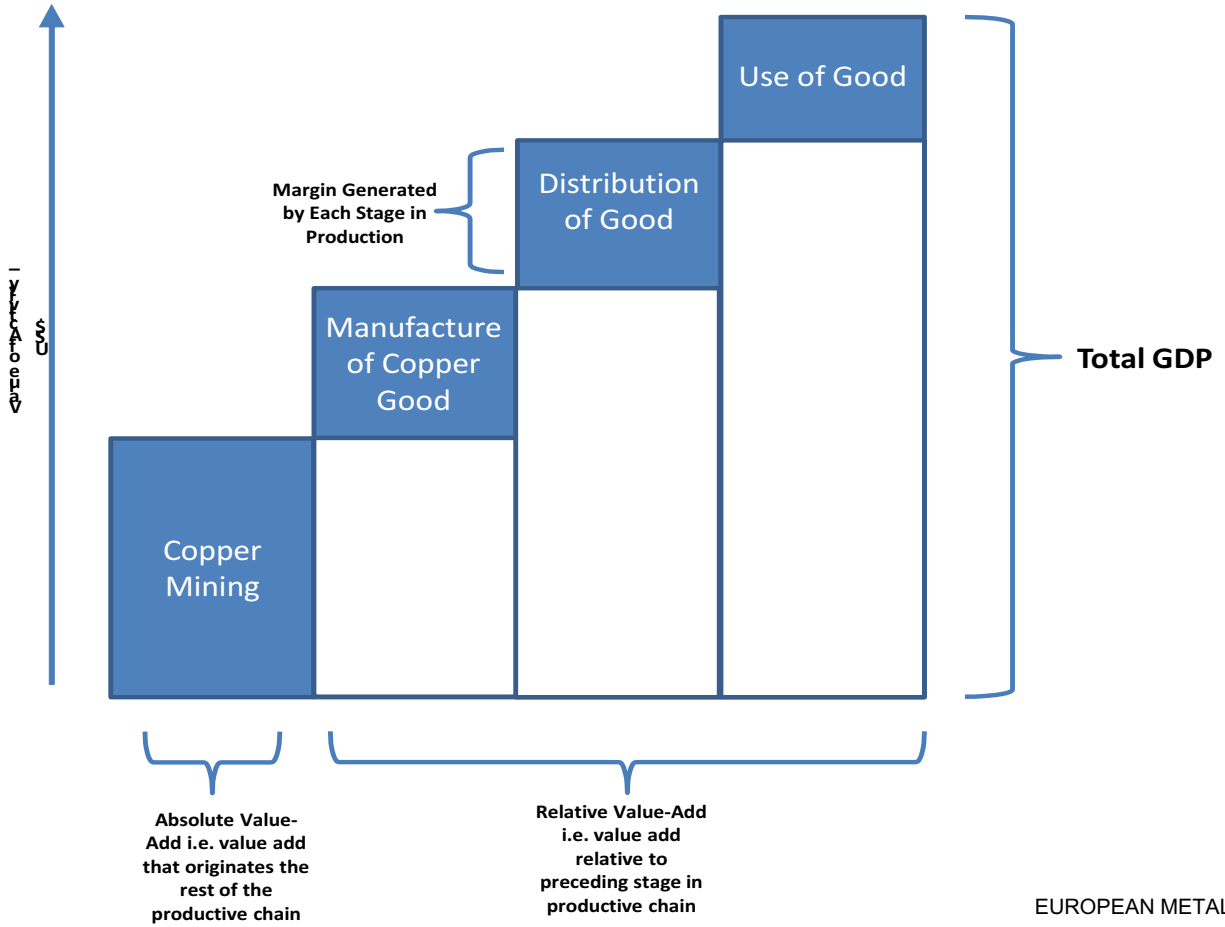


Source:: Maddison, World Bank, WBMS, Wood Mackenzie, Bloomberg, Schmitz, Bernstein Analysis

...and absent Rio Tinto (et al.), Facebook is worthless!

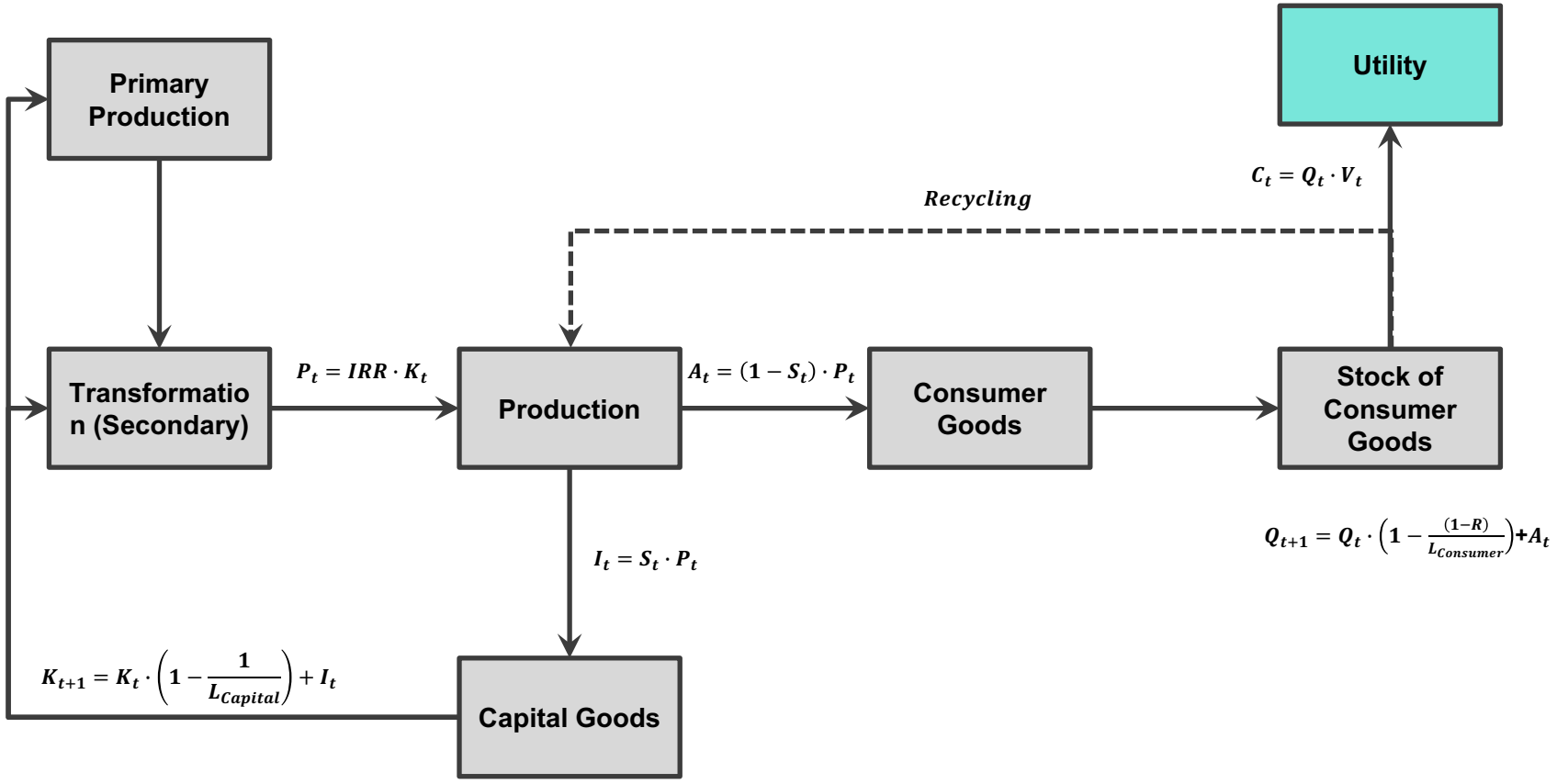
- The structure of production: Each stage apart from the first is transformative; it is only the first stage that is genuinely creative
- It is only the first stage in the productive process where matter is "created" rather than simply transformed.

- If the flow of steel into the global economy is 2% p.a., for example, then the flow of steel-containing goods cannot exceed this number (in a trend sense, and putting the issue of stocking and de-stocking cycles to one side).
- The flow of metals into the economy sets the limit for the growth of the stock of consumer goods
- **Mining is the only activity that is associated with a genuine scarcity.** Every other activity is only scarce in a relative sense.
- Ultimately, this analysis shows that there are only two ways to deliver economic growth:
  - Increase the stock of goods in the economy
  - Increase the rate at which the existing goods in the economy are consumed (increase the flow)



Source: Bernstein

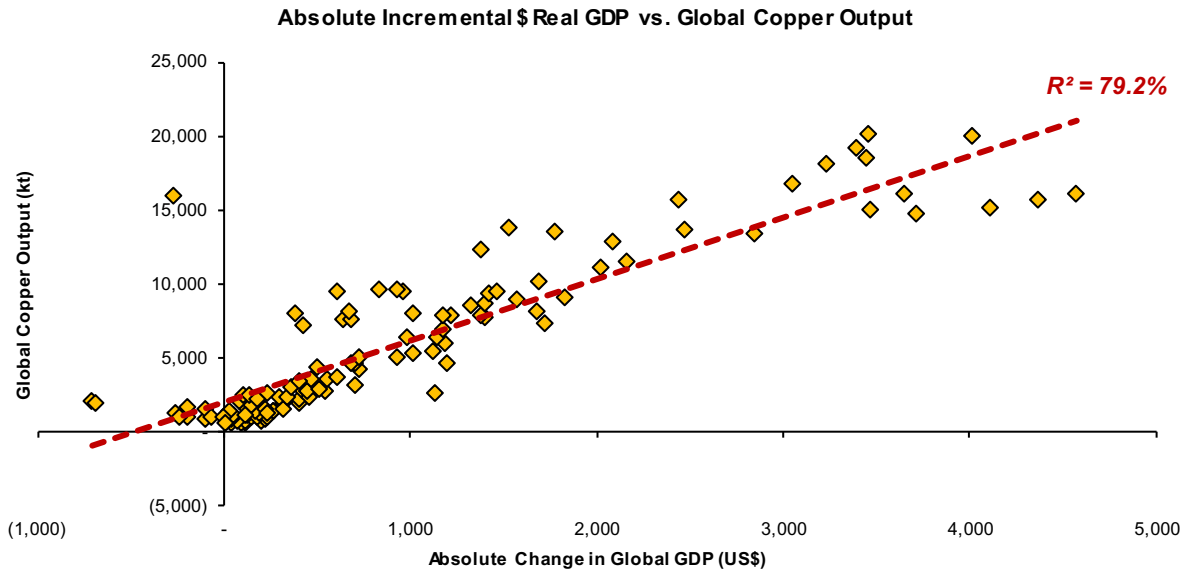
Mining production stands at the core of economic growth…trend growth is given by saving, investment and the return on that investment. Consumption is what happens as a consequence



Source: Bernstein

It is the stock of metal embedded in an economy that supports the flow of consumers services & goods that we measure in GDP

- Looking at incremental real global GDP versus global copper output provides convincing evidence of a *causal* link, supporting our “stock accumulation” conception of growth
- We show the data points for annual incremental real global GDP versus the global output of copper for each year since 1900, and can see the high R^2 statistic of 79.2%



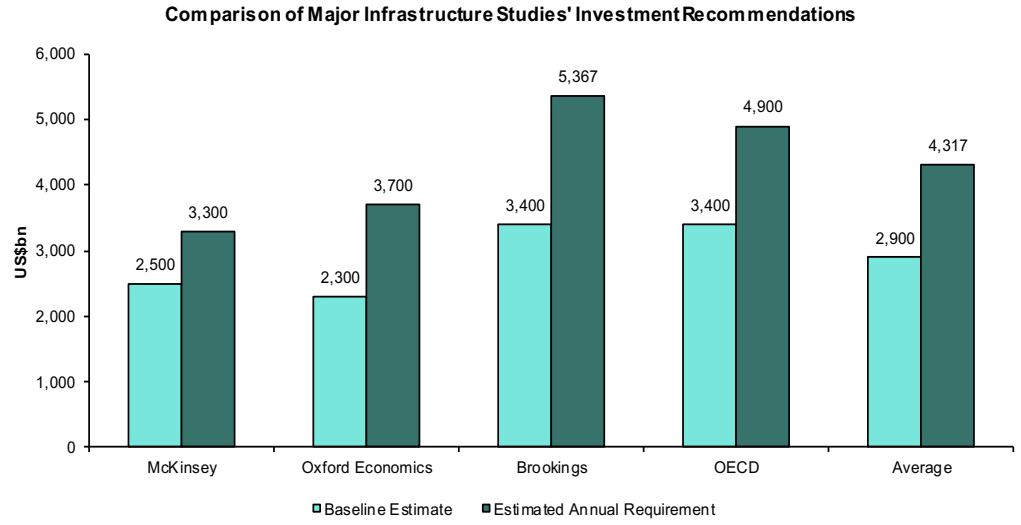
"Man, like every other organism, can only live by the transformation of his environment to his own use. He must transform his environment from a condition where it is less to a condition where it is more subservient to his needs. That special, conscious and intelligent transformation of his environment…we call the Production of Wealth. ***Wealth is matter which has been consciously and intelligently transformed from a condition in which it is less to a condition in which it is more serviceable to a human need****."*

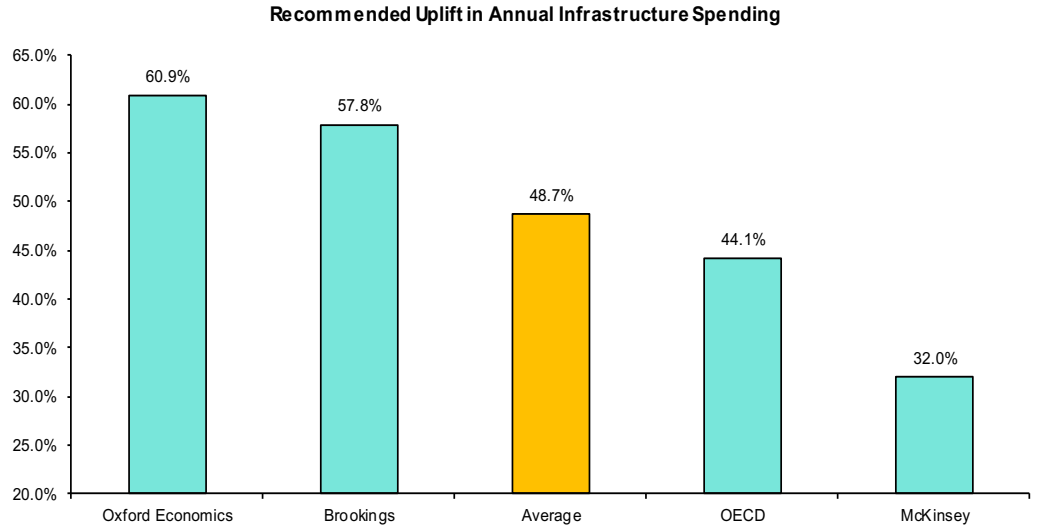
Hilaire Belloc, The Servile State, 1912

Source:: Maddison, World Bank, WBMS, Wood Mackenzie, Bloomberg, Schmitz, Bernstein Analysis

The continued need for investment

There is a clear recognition of the need for an acceleration in infrastructure spending…



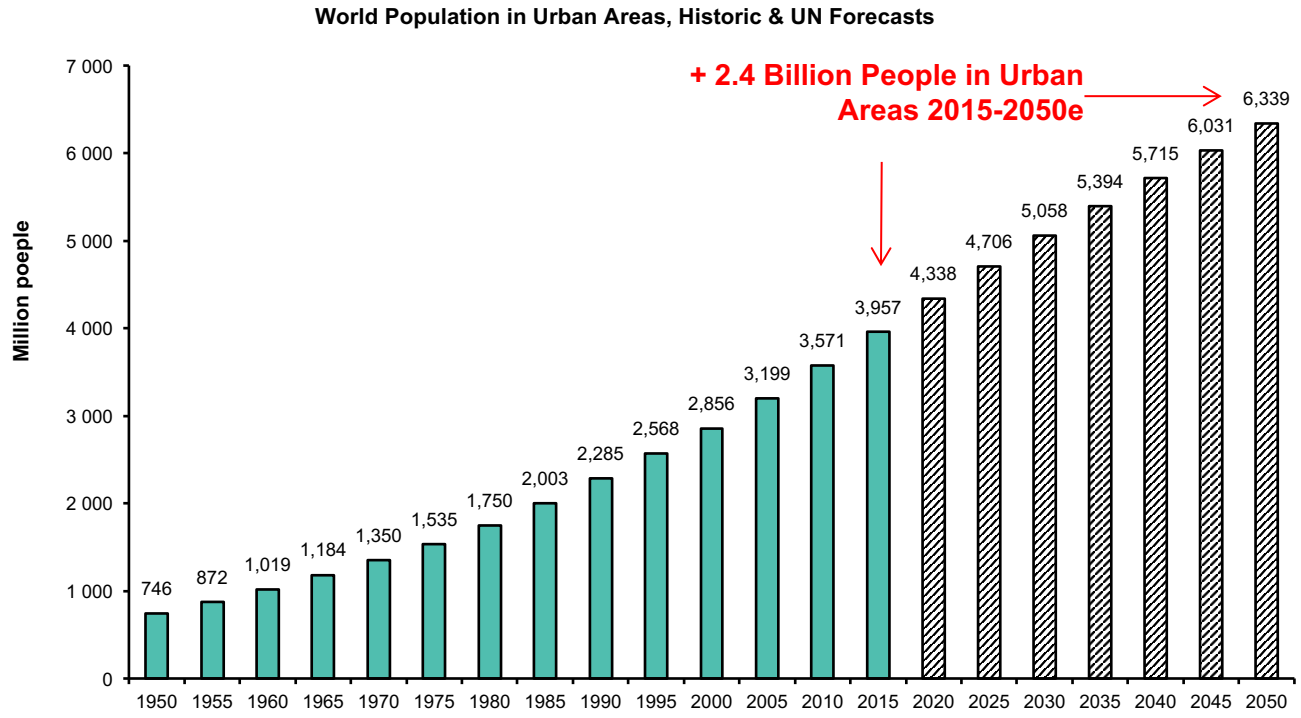


- Major studies of global infrastructure requirements come to the same conclusion, despite significantly different methodologies, with estimates for the required uptick in infrastructure spending over the next c.15 years ranging from 32% to 61%
- These figures even exclude additional incremental spending required in the climate mitigation scenario, which we feel would lead to further upside in the infrastructure investment numbers

Source: Bernstein, Brookings: "Delivering on Sustainable Infrastructure for Better Development and Better Climate", OECD: "Investing in Climate, Investing in Growth", Oxford Economics for the Global Infrastructure Hub: "Global Infrastructure Outlook", McKinsey: "Bridging Global Infrastructure Gaps"

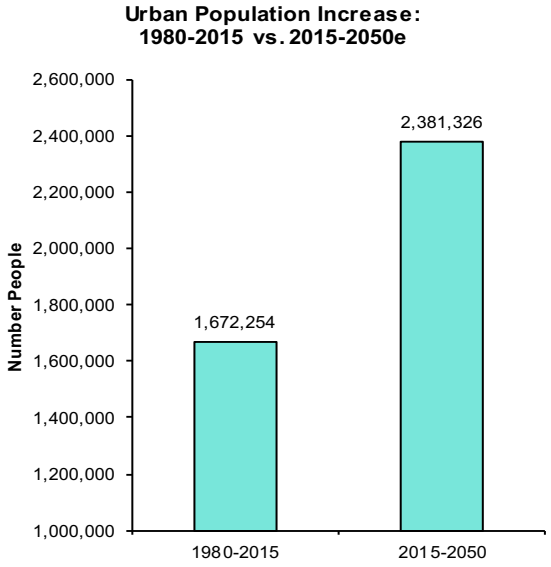
…by 2050, 2.4 billion people will migrate to cities

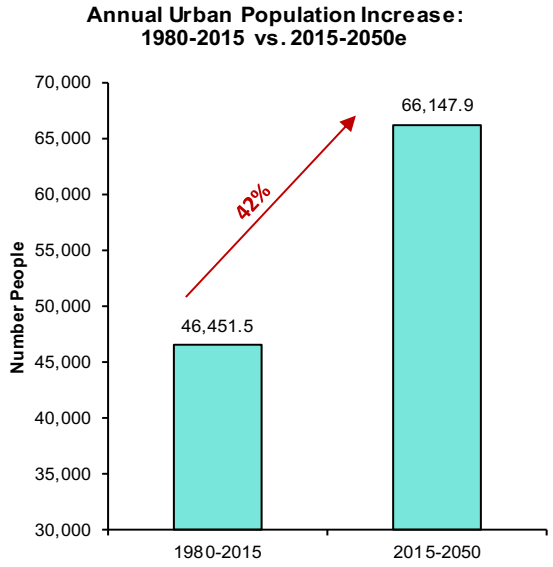
- By 2050, the world population living in urban areas will increase by 2.4 billion people
- 66% of the world population will therefore live in urban areas
- In China alone, 270 million people will migrate to urban areas by 2050, taking the country's urbanisation rate to 76%

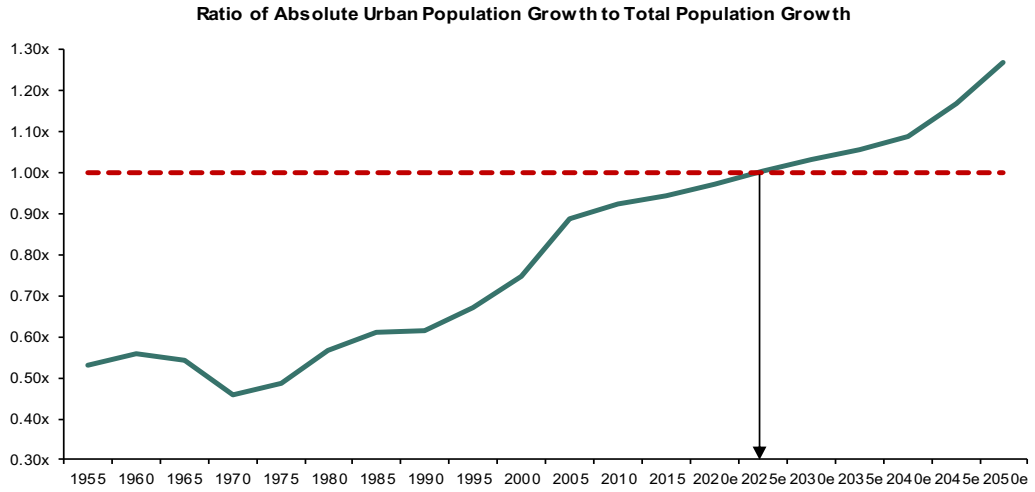


Note: 2020-2050 are UN estimates
Source: UN, Bernstein analysis

Urbanisation will remain one of the defining features of global economic development…





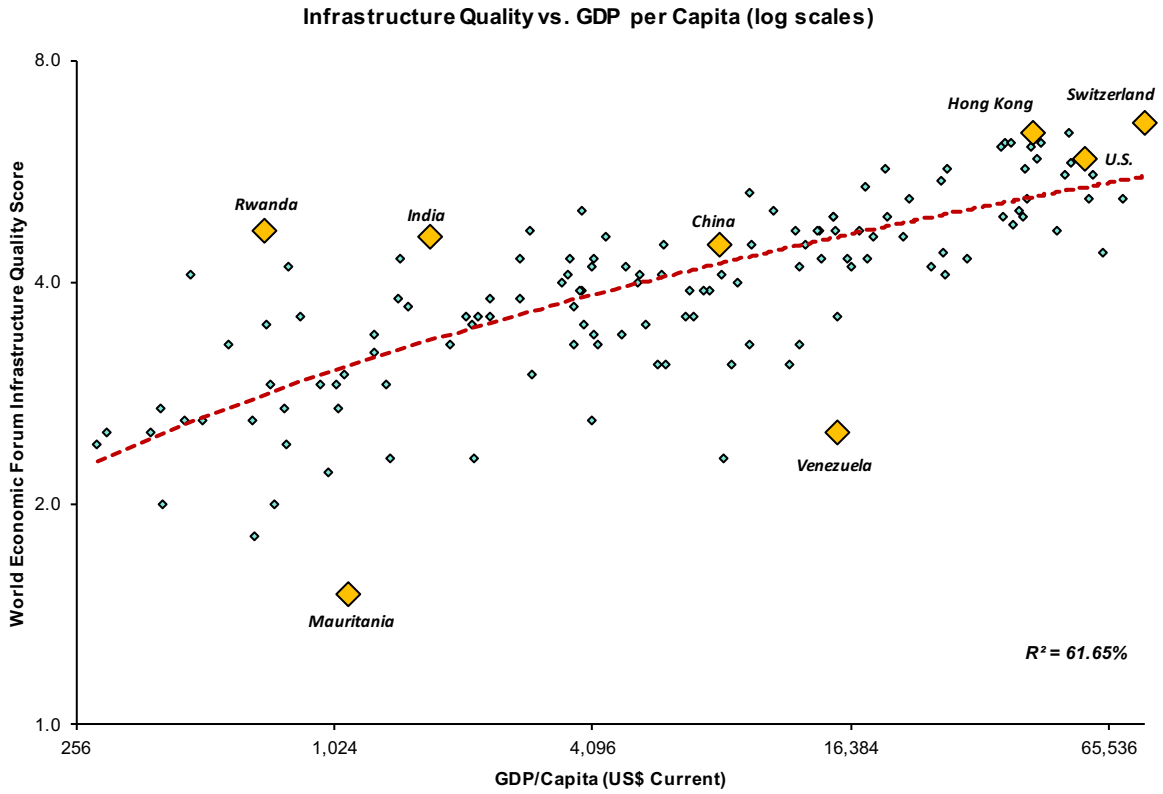


Beyond 2025 we expect that the ratio of urban population growth to total population growth moves above 1.0x for the first time in history

Source: United Nations, Bernstein analysis

There is a benefit to infrastructure spending visible globally

- Of course, attempting to quantify the exact benefits of infrastructure development is fraught with difficulty given issues with measurement, endogeneity and spillover effects.
- But if we look at country-level data, there is a clear positive relationship between infrastructure quality and economic development, for example when we plot the World Economic Forum's most recent 'Infrastructure Quality Score' for each country against the current income level for that country, we see a clear trend line



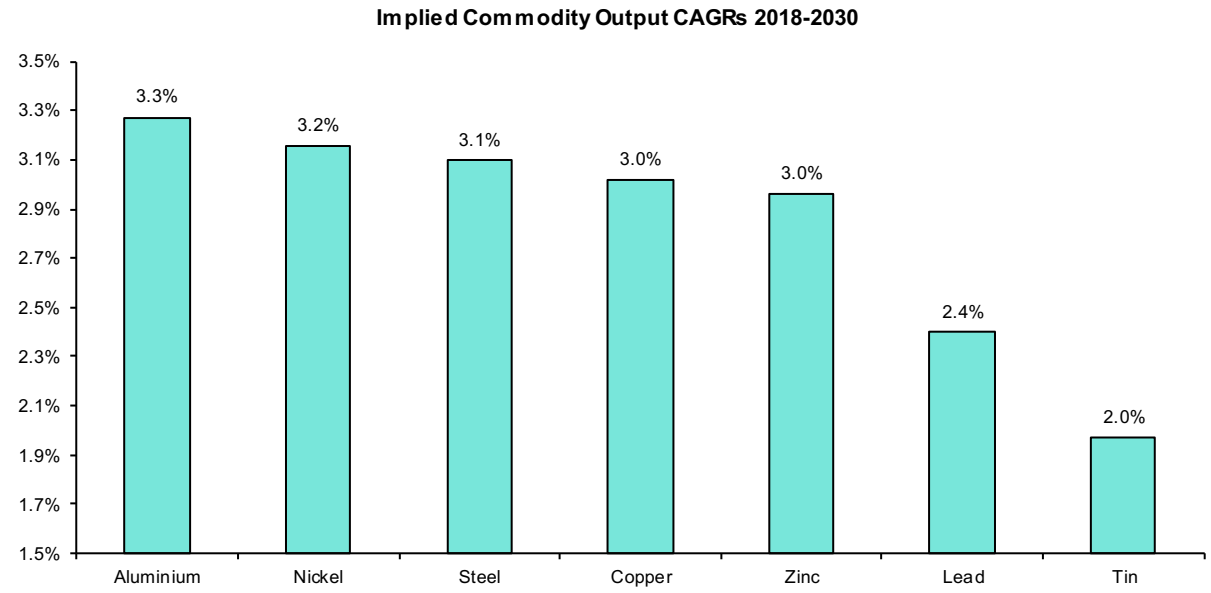
Source: World Economic Forum, World Bank, Bernstein analysis

Our conclusion – if we expect to see a continuation of global economic growth, we must also expect to see a continuation of trend mined commodity output growth

+ Taking the latest IMF real global GDP growth forecasts and rolling them forward to 2030, we can calculate implied absolute levels of GDP in future time periods

+ In turn, we can calculate the implied level of commodity production "required" in 2030

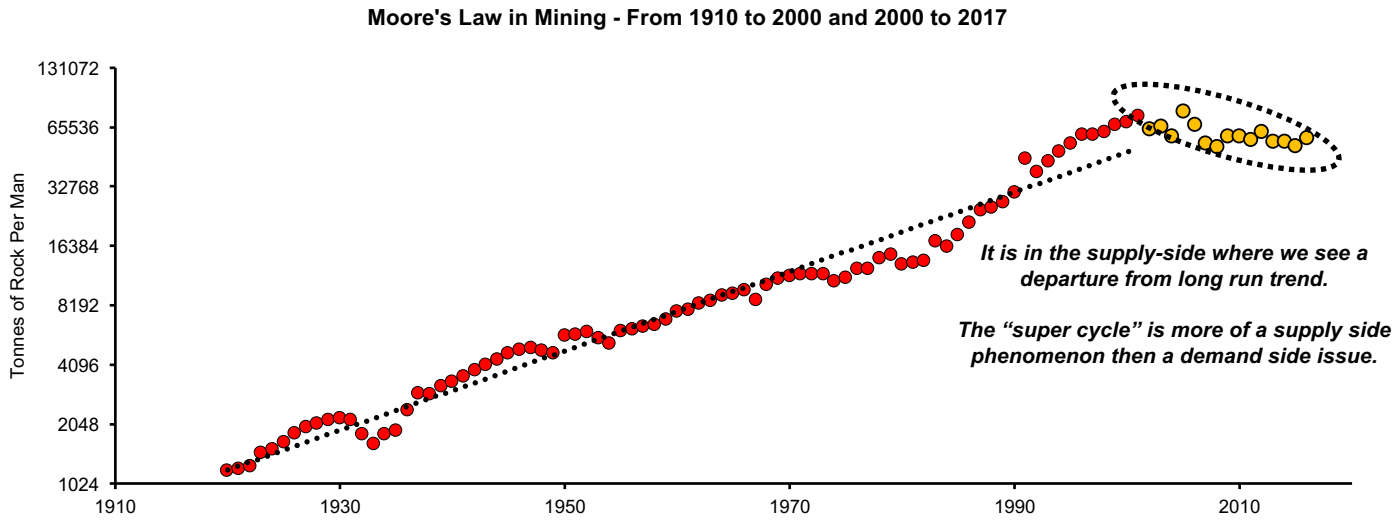
+ Our result – we **should expect continued trend growth in commodity output of roughly 3.0-3.3% for the major commodities** of aluminium, nickel, steel, copper and zinc

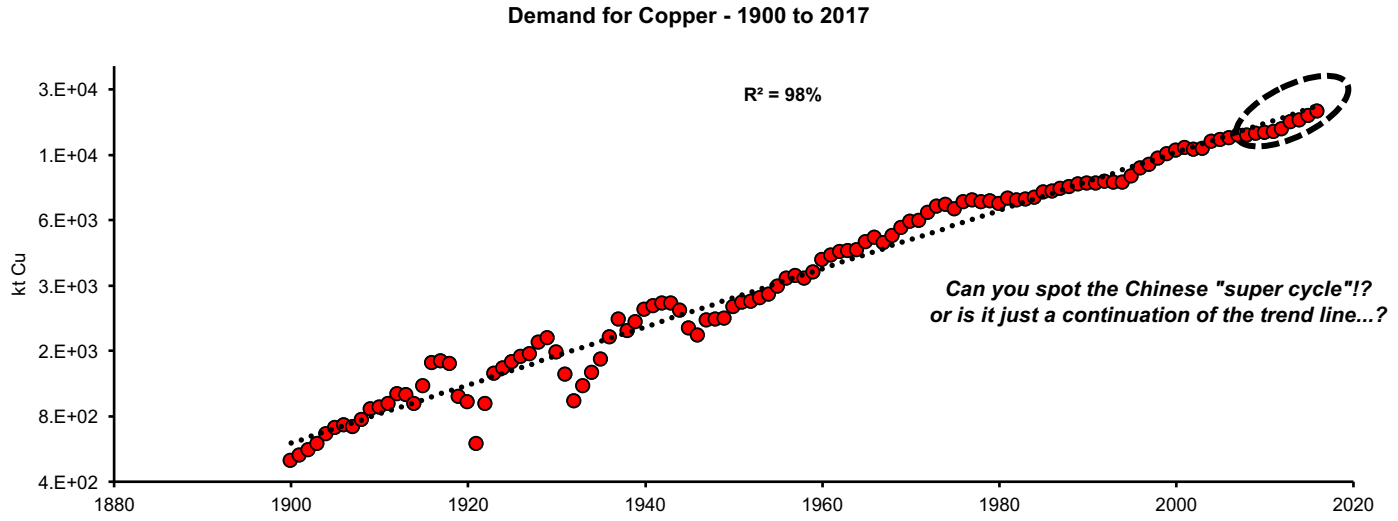


Source:: Maddison, World Bank, WBMS, Wood Mackenzie, Bloomberg, Schmitz, Bernstein Analysis

The issue is not demand but supply

A breakdown of “Moore’s Law in Mining”





Source: Wood Mackenzie, USGS, Schmitz, BLS, Corporate Reports, Bernstein Analysis & Estimates